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PATENT

Attorney Reference Number 6884-65576-01
Application Number 10/688,420

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Johannes Klocke and Linlin Chen

Application No. 10/688,420

Filed: October 16, 2003

Confirmation No. 2239

For: ELECTROPLATING COMPOSITIONS
AND METHODS FOR
ELECTROPLATING

Examiner: Edna Wong

Art Unit: 1753

Attorney Reference No. 6884-65576-01

CERTIFICATE OF MAILING

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PRE-APPEAL BRIEF REQUEST FOR REVIEW

Applicants request review of the final rejection in the referenced application. No amendments are being filed with this request. This request is being filed with a Notice of Appeal. The review is requested for the reasons stated below.

This is a case of cited references disclosing a genus but not teaching or suggesting the claimed species. The cited arts' embodiments were distinguished in Applicants' specification with comparative evidence showing the unexpected superior results of Applicants' compositions. The Examiner disregards that evidence and makes faulty legal analyses.

The references cited are Reid USP 6,793,796 and Reid USP 6,024,857. These references along with the art of record, whether considered alone or in combination, do not teach or suggest the electrochemical deposition compositions having the claimed constituent concentration ranges and ratios.

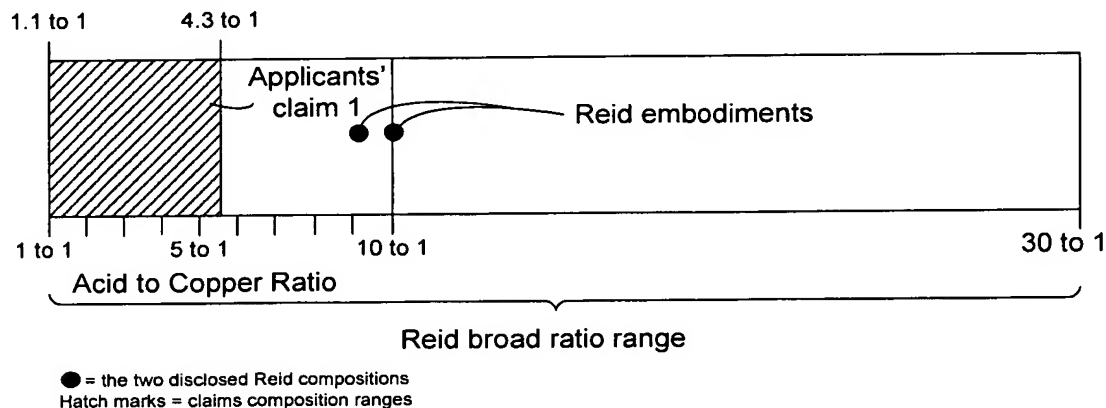
Applicants discovered surprisingly superior results achieved using electrochemical deposition compositions with certain narrow, claimed concentration ranges of acid to copper. Using comparative testing, Applicants confirmed that their discovery provided superior depositions, far exceeding the prior art electrochemical deposition compositions. The comparative test data and evidence is set forth in Applicants' specification (Spec. pp. 22-26 and

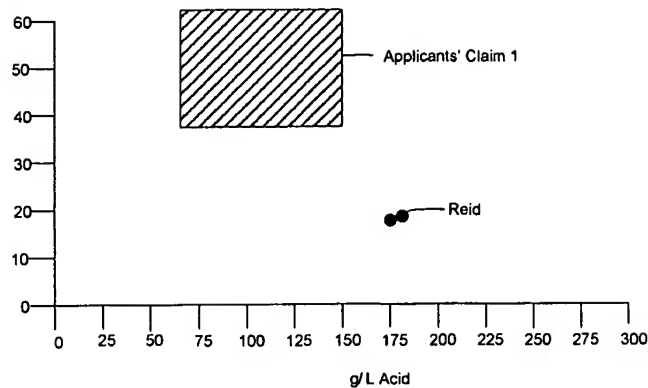
discussed further below).

Applicants obtained the surprisingly superior results by using its claimed electrochemical deposition compositions having certain, narrow acid and copper concentration ranges. For example, claim 1 recites an electrochemical deposition composition having about 65 to about 150 g/L acid and about 35 to 60 g/L copper (i.e., a 1.1 to 1 to a 4.3 to 1 acid to copper concentration ratio). As depicted in the illustrations below, Applicants' claimed compositions, contrary to the conventional wisdom, have low acid to copper concentration ratios.

The Reid references follow the conventional wisdom of high acid to copper ratios. First, Reid broadly disclose electrochemical deposition compositions having: Acid = 0-300 g/L and Copper = 10-60 g/L, i.e., an acid to copper ratio of 0 to 30 ('796 patent c. 7, ll. 52-53). The Reid references disclose only two examples or specific compositions: 175 g/L acid to 17.5 g/L copper (a 10 to 1 ratio) and 170 g/L acid to 18 g/L copper (a 9.4 to 1 ratio).

The below graphs aid in understanding just (1) how broad the Reid acid and copper concentration ranges are as compared to Applicants' narrowly claimed composition ranges and (2) how far the Reid specific embodiments are outside of Applicants' claimed concentration ranges and acid to copper ratios. Applicants' claimed acid and copper concentrations and acid to copper ratios are shown with hatch marks. The full scale for the bar graph and the chart is equal to the broad ranges disclosed by Reid. The two Reid embodiments are shown with bullet points.





65 to 150 acid and 35 to 60 Cu are the claimed compositions
175 acid to 17.5 Cu and 180 acid to 18 Cu are the Reid compositions

Neither the Reid references cited by the Examiner nor the other art of record, whether considered alone or in combination, teach or suggest the electrochemical deposition compositions having the claimed constituent concentration ranges and relative concentrations. On the contrary, the only specifically disclosed examples set forth in these Reid references have essentially the same (high) acid-to-copper ratios distinguished by Applicants' comparative data. In other words, the cited arts' embodiments were distinguished in Applicants' specification with comparative evidence showing the unexpected superior results of Applicants' compositions. The Comparison Data Showed Reid's Compositions to be Significantly Inferior to Applicants'

The Reid compositions are almost identical to the very prior art that Applicants' specification and comparative test data distinguished as inferior to Applicants' claimed compositions. Reid embraces the conventional wisdom of high acid to low copper concentration ratios i.e., a 10 to 1 acid to copper ratio ('796 patent) and a 9.4 to 1 ratio ('857 patent).¹

Applicants' test data compare Applicants' acid and copper compositions to the prior art acid and copper compositions. For example, Applicants conducted tests to compare prior art compositions having 180 g/L acid and 20 g/L Cu to Applicants (Spec. p. 23, ll. 10-12). For comparison purposes, prior art electroplating compositions and Applicants' compositions were tested under the same conditions with identical additives at identical concentrations (Spec. p. 22, ll. 17-18). The only variable in the compositions tested were the different acid and copper concentrations (and hence, the relative ratios).

When using the prior art compositions the results were a copper fill having unacceptable

¹ With the '857 Reid patent disclosing basically the same – specifically, (Examples 1-3 at c. 5 - c. 6) having an acid concentration of 170 g/L and a copper concentration of 18 g/L (a 9.4 to 1 ratio).

voids (see, e.g., Spec. p. 4, ll. 11-14; Fig. 6(a)). The claimed compositions gave far superior deposition fill results (Spec. pp. 22-26). The comparison data thus clearly rebuts any *prima facie* case the Examiner alleges exists.

Based on a faulty factual and legal analysis, however, the Examiner disregards the comparative evidence that distinguishes the art of record and rebuts the *prima facie* case of obviousness. The Examiner acknowledges that the claimed acid to copper concentration ranges are different from the two taught compositions in Reid (OA 6/8/2006, p. 3). The Examiner also apparently concedes that the relative acid to copper concentrations are critical for providing electrochemical deposition compositions that will adequately plate sub-micron sized integrated circuit device features.²

First, the Examiner argues that even though Reid does not give any examples near the claimed ratio ranges, it allegedly achieves the same results using a different approach – by adding other ingredients (e.g., accelerators and levelers) to the compositions rather than as Applicants have, by changing the conventional wisdom regarding the acid to copper ratios (OA 6/8/2006, last para. p. 3 - p. 4). The Examiner has the legal analysis backward. That Reid takes a different approach to solve the problem solved by Applicants' claimed compositions is evidence of **non**-obviousness, not obviousness. Otherwise no one could patent a novel, non-obvious solution to a problem if somebody else first proposed a different solution to the problem. That is not the law. The correct legal analysis is whether the claimed solution to the problem, Applicants' claimed acid and copper concentrations, is taught or suggested by the Reid acid and copper compositions.

Second, the Examiner's analysis is factually wrong - the Examiner plainly disregards the comparative data. The Examiner asserts that the unexpected superior results disclosed in Applicants' specification are "inherent" properties in the prior art compositions because those properties were merely the discovery of previous unappreciated properties of the prior art compositions (OA p. 3). But the comparative test data proves otherwise. As the acid and copper concentrations were the only variables in the comparison testing, it is clear that the prior art acid and copper concentrations did not possess those beneficial properties of the claimed compositions. On the contrary, the prior art compositions resulted in voids in the depositions while the claimed compositions did not (Spec. pp. 22-26).

² The Examiner states that "the copper and acid concentrations are not the sole criticality" indicating the Examiner understands that these concentration ranges are indeed critical. Office action dated June 8, 2006, page 3.

Lastly, the Examiner relies on the genus allegedly disclosed in Reid to reject Applicants' species claims. The broad ranges disclosed in Reid (acid 0-300g/L and copper 10-60 g/L) do not teach or suggest Applicants' narrowly claimed compositions. The Examiner ignores the well-settled law that a *prima facie* case of obviousness can be, and in this case has been, rebutted.

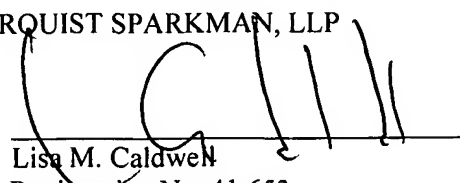
Where a cited reference discloses a genus that includes the claimed species, for example, if a reference broadly discloses composition constituent concentration ranges that encompass the claimed compositions constituent ranges, a *prima facie* case of obviousness arises. The burden is then shifted to the Applicant to show why the narrower claimed ranges are not obvious in view of the broad disclosure. *In re Peterson*, 315 F.3d 1325 (Fed. Cir. 2003); MPEP §§ 716.02(a) and 2144.05. Applicant can rebut the *prima facie* obviousness by showing that the claimed composition ranges are critical to achieve unexpected results relative to the prior art ranges. *In re Peterson*, 315 F.3d 1325 (Fed. Cir. 2003); MPEP § 2144.05(III). As discussed above, the Examiner recognizes that the acid and copper concentrations are critical. Applicants' comparative data varying the acid and copper concentrations clearly rebutted the *prima facie* case of obviousness.

Further, the prior art reference must provide sufficient guidance to a person of ordinary skill in the art to make the narrower claimed composition, in order to make those claimed compositions obvious. Here, the Examiner cites nothing in Reid that would guide one to transform the broad ranges of Reid into Applicants' superior, narrowly claimed compositions with their unconventional low acid-to-copper ratio. If the references' ranges are so broad as to be meaningless with respect to the claimed compositions and the references provide no guidance on providing the narrowly claimed invention with its beneficial features, then the references do not support an obviousness rejection. *Minnesota Mining and Manufacturing v. Johnson and Johnson Orthopedics, Inc.*, 976 F.2d 1559 (Fed. Cir. 1992). The Reid genus does not teach or suggest Applicants' claimed compositions.

Respectfully submitted,

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